XLIII. *Aſtronomical Obſervations, made in the Forks of the River* Brandiwine *in* Pennſylvania, *for determining the going of a Clock ſent thither by the* Royal Society, *in order to find the Difference of Gravity between the Royal Obſervatory at* Greenwich, *and the Place where the Clock was ſet up in* Pennſylvania; *to which are added, an Obſervation of the End of an Eclipſe of the Moon, and ſome Immerſions of* Jupiter's *Firſt Satellite obſerved at the ſame Place in* Pennſylvania: *By* Charles Maſon *and* Jeremiah Dixon.

Read December 15, 1768.

The Place where theſe Obſervations were made is the Northernmoſt Point of the Lines that were meaſured for a Degree of Latitude, or Point N. (ſee TAB. XIII. fig. 2.) relative to that Meaſure; it lies 31 Miles Weſt, by Meaſurement; and 10″,5 South of the Southernmoſt Point of the City of Philadelphia, as found by the Sector.

1766		Time per Clock.					
Decemb.	d	h	′	″	h	′	″	
☿	24	4	28	40	. . . . .			
.. ✱ ..			30	18+	5	25	3	Equal Altitudes of Capella.
			32	5½		26	40	
	28	4	28	41	5	20	59	
.. ✱ ..			30	22+		22	47−	Equal Altitudes of ditto.
			32	10		24	30½	
	30	4	5	52½	5	43	24+	
.. ✱ ..			7	12		44	46½	Equal Altitudes of ditto.
			8	34		46	4½	
1767								
January.								
♃	1	4	10	33	5	37	45	
			11	55		39	10	Equal Altitudes of ditto.
			13	19½		40	31−	

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1767 Time per Clock.

January.	d	h	′	″	h	′	″	
☿	7	3	50	26	5	55	8½	Equal altitudes of Capella.
			51	39+		56	27	
			52	56½		57	41½	
♃	8	4	4	48	5	40	3	Equal altitudes of ditto.
			6	7½		41	24	
			7	30—		42	44½	
								The first Satellite of Jupiter immerged.
.. ✳ ..		12	59	30				d h ′ ″ Apparent time 8 17 42 47½
♄	10	6	21	28	8	2	45	Equal altitudes of Castor.
.. ✳ ..			22	43		4	3	
			24	00		5	18—	
								The first Satellite of Jupiter immerged.
		7	34	18				d h ′ ″ Apparent time 10 12 10 23.
♀	16	4	5	4+	5	35	23	Equal altitudes of Capella.
.. ✳ ..			6	25		36	47	
			7	50		38	7	
☽	19	4	4	8½	5	34	44	Equal altitudes of ditto.
.. ✳ ..			5	27½		36	8	
			6	52		37	29	
♂	27	3	32	53	6	2	7	Equal altitudes of ditto.
			34	5—		3	21½	
			35	19½		4	34½	
February.								
♂	3	4	21	12½	6	36	10½	Equal altitudes of β Aurigæ . . Windy.
.. ✳ ..			22	22		37	24	
			23	35+		38	34 :	
☿	4	3	34	52—	5	56	0½	Equal altitudes of Capella.
			36	5		57	16+	
			37	20		58	29	
☉	8	3	55	32	5	33	5½	Equal altitudes of ditto.
.. ✳ ..			56	50+		34	26+	
			58	12		35	45½	
☽	16	13	44	50	The first Satellite of Jupiter was not immerged flying clouds.			
.. ✳ ..		13	46	25	Ditto was immerged.			
☿	25	4	11	43—	5	7	9	Equal altitudes of Capella.
			13	21		8	55½	
			15	7—		10	32+	
.. ✳ ..		10	42	50 :: First Satellite of ♃ immerged. Ap. time 25d 12h 24′ 40″ ::				

From

From theſe obſervations we have the time of Capella's paſſing the meridian, and the rate of the clock's going as follows:

1766 Decemb.		✱ paſted merid. per clock. h	′	″	Clock loſes of Sid. time per day. ″	Mean ſtate of therm. °
	24	4	57	40+	16,3	35
	28		56	35	18,0	23
1767	30		55	59	13,4	6
January.	1		55	32+	14,8	37
	7		54	3	17,0	20
	8		53	46	16,3	37
	16		51	36	16,0	31
	19		50	48+	15,63	33
	27		48	43+	15,35	28
February.	4		46	40½	15,5	30
	8		45	38½	15,9	35
	25		41	8—		

1764 March. ☽ eclipſed. Time per watch.

	h	′	″	
♄	17	8	4	10 Eclipſe of the ☽ ended.

h	′	″		
8	58	46	10 27 30 ::	Equal altitud. of Regulus.
9	1	16	29 41	
4	5		32 9	

The watch went very regular ſider. time.

—Hence the eclipſe ended at 8h 21′ 59″ app. time, in the forks of the river Brandiwine.

N. B. The edge of the earth's ſhadow on the ☽'s diſk was the beſt defined I ever ſaw: it was remarkably diſtinct from the penumbral ſhade.

N. B. The clock was firmly ſcrewed to a piece of timber, 22 inches in breadth, and five inches and a quarter thick; the ſaid piece of timber was let four feet into the ground, which was compoſed of a very firm, dry, hard clay.

The clock was placed in a tent, with Fahrenheit's thermometer hung to its ſide; and a blanket was wraped round the clock and thermometer, to ſecure it from any wind that might enter the tent. The pendulum was adjuſted to the upper ſcratch, with N° 3. at the Index, as directed by the Rev. Mr. Maſkelyne, Aſtronomer Royal: but the ſpring at the ſuſpenſion of the pendulum having been broke, (when the ſhip, in which it was ſent, was wrecked on the Jerſey coaſt) we cannot be certain that the pendulum is now of the ſame length as it was when ſent from London.

Thoſe obſervations marked : are a little dubious; thoſe marked :: are very dubious; thoſe marked . . ✱ were made per Mr. Dixon. The eclipſes of ♃'s ſatellites were obſerved with a reflecting teleſcope of one foot focus, that magnified about 70 times.

1766 Decemb. d		Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the after. in the Tent	Air	Vibration of the pend. on each ſide of O. that is, half the arch of vibration. ° ′	Remarks
☿	24	..	..	43	45—		
	25	..	..	44	46		
	26	38	37	45	47	1 40—	
	27	38	41	40	42		
	28	21	18	31	26	1 35	Near midn. the ther. in the { Tent 20 Air 16
	29			28	28		At 10h¼ P. M. therm. in the { Tent 29 Air 28
	30			32	32		Near midn. in the Tent 17 Air 14
	31	5 above O.	3 below O.	18	20	both above O.	

		Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the aft. in the Tent	Air	Vibration of the pend. on each side of O. that is, half the arch of vibration.	
1766 Decemb.	d						
	31	At $8^h\frac{1}{4}$ P. M. ther. in the tent at O. in the air at 7 below O.					
1767		At $10^h\frac{1}{4}$ P. M. ditto in the tent at 3 below O. in the air at 13 below O.					
Jan.	1	At 7^h 6′ in the morn. the ther. in the { Tent 10 / Air 20 } below O.					
		At 0^h 45′ P. M. ther. in the { Tent 21 / Air 17 } above O. Vibration = 1° 12′					
		At 11^h 4′ P. M ditto in the { Tent = 3 / Air = 12 } below O Vibration = 1 10					
	2	At 6^h 42′ in the morn. ther. in the { Tent 9 / Air 22 } below O.					
		At 10 ditto vibration of the pendulum = 1° 5′ on each side of O. The pendulum now swings a little farther on the west side of O. than on the east side. The clock faces the north.					
				21	15	1° 7′	At 9 P. M. In the { Tent 9 / Air 5
☽	3	11	9				
☉	4	before ☉ rise	34	39	39	1° 20′	
	5	37	37	48	49	1 35	{ Pend. now swings rather farthest on the east side of O.
	6	49		53	54	1 40	At $8\frac{1}{2}$ P. M. in the { Tent 43 / Air 44
	7	At 11^h P. M. in the tent 25, in the air 26.					
	8	28		at $10\frac{1}{2}$ P. M. ther. in the tent 23.			
	9	17		40	40	1° 35′	{ Pend. swings 8′ more on the east side of O. than on the w.
	10			43			At midn. ther. in the air 25.
☉	11			50	47		
	12						At 4 P. M. in the { Tent 42 / Air 44
	13			42	45	1° 40′	The pend. swings as on the 9th.
	14	23		33	33		
	15	33		39	41		

1767 January	d	Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the aft. in the Tent	Air	Half the arch of vibration.	
	16	30	30	39	37	1° 35′	The pend. ſwings as before.
		At 9h 5½ P. M. ther. in the		Tent 24			
				Air 21			
	17	at 9h A. M. 28 tent 25 air		43	39		
☉	18	33	31	39–	39		
	19	25	26	39	36	At 9h ½ P. M. ther. in the	Tent 21
							Air 18
	20			39	40		
	21	39	39	40	40		
	22	23	21	27	27	1° 30′	The pendulum ſwings to the eaſtward as before.
	23	25	23	32	32		
	24	32	32	43	40	1° 30′	Wound up the clock.
	15	32	32	31	30		
	26	28	27	At 4h ½ P. M. ther. in the			Tent 32
							Air 32
♂	27	21	20	At 4h ½ P. M. in the			Tent 27
							Air 25
				9 ditto			Tent 15
							Air 12
	28	11	14	36	32	1° 20′	The pendulum ſwings as before.
	29	15	13	35	34		
	30	16	16	31	35	1 20	
	31	32	35	At 4h ¼ P. M. in the			Tent 36
							Air 36
Feb.	1	36	35	36	37		
	2	15	13	40	34		
	3	16	15	41	38	1° 30′	
				At 9h ½ P. M. in the			Tent 26
							Air 25
	4	14	10	34	32	1° 30′	
		At 9h P. M. in the		Tent 24			
				Air 23			
	5	30	32	45	41		
	6	13	12	28–	24	1 30	
	7	13	12	34	36		

1767	d	Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the aft. in the Tent	Air	Half the arch of vibration.	
Febr.							
	8	25	24	54	52	1° 35′	
		At 8h ½ P. M. in the		{ Tent 33 Air 32			
	9	32	32	42	41		
	10	41	41	34	35		
	11	25	25	40	38	1 40	The pendulum ſwings as before.
	12	30	29	38	41		
	13	31	31	32	33		
	14	28	24				
	15	26	27	At 4h P. M. in the		{ Tent 34 Air 33	
	16	18	10	39	48		
	17	25	17	28	28		
	19			39	44		
♀	20	near noon	{ tent 46 air 55	48	59		
☉	22	14	12				
♄	28				69	1° 40′	{ Pend. vibrates about 8′ farther on the E. ſide of O, than on the W. ſide of O, as before.
March	1				56		
	2				46		
	3				57		
	4				49		
	5				51		
	6				51		
	7				48		
	8				56		
	9				51		
	10				50		
	12	at ☉ riſe	11		26		
	13	ditto	7		28		
	14				36		
	15				47		
	16				71		
	17				67		
	18	ſnow					
June	4				91		
	5				95		
	6				95		

The point of the pendulum ſwings ſomething farther back from the arch (ſhewing the degrees and minutes) than it did when it was ſet up.

Took down and packed up the clock.

1767 June	d	Height of the ther. at about 7h in the mor. in the Tent	Air	Height of the ther. at about 2h in the aft. in the Tent	Air	
	7				93	
	8				91	
	9				80	The air much altered, being very cool and pleaſant.
	10	At 4h ½ P.M.		90 at 7h P.M.	80	

N. B. The thermometer is in the ſhade, and in the ſame place it was in laſt winter.

XLIV. *Extract*